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Presentation Time: 11:00 AM–12:45 PM
***In Vivo* Intraocular Pressure Measurements Using A Miniaturized Nano-Photonic Sensor Implant**
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Purpose: We have been developing a nanophotonic pressure sensor whose optical resonance is directly related to intraocular pressure (IOP). Bench testing has demonstrated sensor near-infrared (NIR) reflectance to accurately track pressures from 0-50 mmHg. The current study examined sensor performance following implantation into rabbit eyes for up to one month.
Methods: The nanophotonic IOP sensor is a micro-/nano-fabricated 800-micron-diameter silicon microcavity flanked on one side by a flexible silicon-nitride membrane embedded with reflective gold nanodots. Sensors were attached to acrylic intraocular lenses (IOL) and implanted into the eyes of New Zealand White rabbits following lens phacoemulsification. Sensor-resonance signatures carrying IOP information were obtained 2 inches away from the eye right after sensor implantation, and at 2 & 4 weeks. Measurements were also made before and after IOP elevation by intraocular saline injection. TonoVet IOP measurements were made in parallel in all cases for comparison.
Results: *In-vivo* sensor measurements exhibited excellent signal-to-noise (SNR) ratio of 13 dB at all time points. Sensor-derived IOPs ranged from 6.8 to 7.1 mmHg at 2 and 4 weeks. Concurrent TonoVet IOPs matched all sensor IOPs but were consistently 0.5-3 mmHg higher. Intraocular saline injection right after implantation caused sensor-IOP readings to go from 7.0 to 20.0 mmHg.
Conclusions: A miniaturized nanophotonics-IOP sensor using NIR light as a sensing medium provides *in-vivo* IOP measurements in rabbits for at least 1 month after implantation. The sensors exhibited good SNR ratio, stability, and tracking of IOP increases.

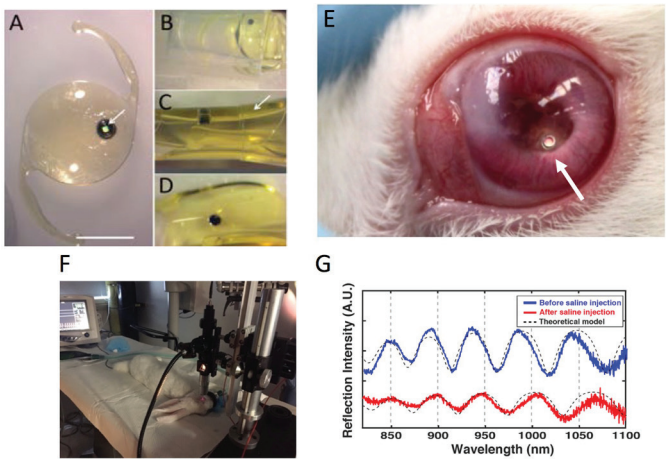

Figure 1. (A-D) The 800-micron IOP sensor mounted on an IOL and folded for ocular insertion; arrow in A points to nanodot array reflection; and (E) The sensor (arrow) in a rabbit eye. (F) *In-vivo* measurement on anesthetized rabbit; (G) *In-vivo* optical resonance signatures before and after saline injection.

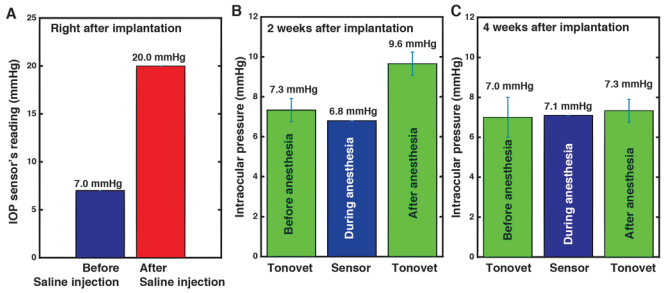

Figure 3. (A) Sensor-derived IOP after saline injection increased from 7.0 to 20.0 mmHg; (B) and (C) sensor-derived IOPs from a sensor at 2 & 4 weeks, compared with TonoVet measurements before and after sedation.
Commercial Relationships: Jeong Oen Lee, None; **Juan Du**, None; **Haeri Park**, None; **Mehmet Sencan**, None; **Max Kudisch**, None; **David Sretavan**, None; **Hyuck Choo**, None
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Intraocular pressure affects structural glaucoma progression differently in patients of African and European descent
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Purpose: To examine the relationship between intraocular pressure (IOP) and changes in structural progression in open-angle glaucoma (OAG) patients of African (AD) and European descent (ED) after four years
Methods: 85 patients with OAG (20 AD, 65 ED) were assessed for IOP and for optic nerve head (ONH) morphology and retinal nerve fiber layer (RNFL) thickness by Heidelberg retinal tomography 3 (HRT3) every six months for a four-year period. Additionally, 80 patients with OAG (18 AD, 62 ED) were assessed for IOP and for ONH parameters by optical coherence tomography (OCT) every six

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